

The Historical Perspective, Current Advancements and Innovations in Laparoscopic Cholecystectomy

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Cholelithiasis is the most common affliction of the hepatobiliary system and cholecystectomy, the commonest surgical intervention. Ever since the operative management of gallstones dawned on the surgical arena, it has been in a state of continuous evolution, exactly parallel to the evolution of surgical techniques and technical armamentarium. The first interaction of gallstones and surgery dates back to 1687 when Stal Pert Von Der Weil, while operating upon a patient of peritonitis, found gallstones [1]. This was followed by the development of open cholecystectomy technique a century ago by a German surgeon, Carl Johann Langenbuch[1]. This technique received little recognition but later became the gold standard for the definitive management of symptomatic cholelithiasis [2]. Langenbuch's open cholecystectomy remained the gold standard for symptomatic cholelithiasis for over a century. The only major change in the operation was the introduction of operative cholangiography for the detection of common bile duct stone by Mirizzi over 60 years ago [3]. The introduction of laparoscopic cholecystectomy proved to be a new era in the management of cholelithiasis. Since the performance of the first laparoscopic cholecystectomy by Prof Dr Med Erich Mühe of Böblingen, Germany in 1985, this procedure overtook open cholecystectomy as the treatment of choice in cholelithiasis [4]. Today laparoscopic cholecystectomy is one of the most commonly undertaken procedures in general surgery, with more than 500,000 performed annually [4]. In March 1987 when Dr. Mühe was completing a gynecologic laparoscopy on a woman who was also suffering from symptomatic gallstones, he shifted his laparoscope to the subhepatic area. Upon finding a comparatively free and supple gallbladder, he decided to remove it laparoscopically, instead of opening it up. He performed the procedure successfully and the patient recovered without complications. Within two years, the procedure was adopted and gained a momentum among surgeons in the USA. Finally, in September 1992, a National Institute of Health (NIH)

consensusconference held in Bethesda concluded that laparoscopic cholecystectomy was the treatment of choice for cholelithiasis[5]. The conventional laparoscopic cholecystectomy is done by four ports; a 10mm optical port at umbilicus, a 10mm and a 5mm port in epigastrium and in the midclavicular line, respectively for the surgeon to work, and a 5mm port in the midaxillary line at the umbilical level for the assistant to retract the gallbladder fundus. The laparoscopic cholecystectomy became an instant hit and its march ahead did not show any sign of halt. Although initially, laparoscopic cholecystectomy in pregnancy was absolutely contraindicated but now it is performed during the second trimester with low complication rates. The difficulties include poor ergonomic situation and limited intraabdominal working space. Once the safety of laparoscopic cholecystectomy was established, surgical interest has focused on reducing the invasiveness and scarring caused by the procedure. With increasing experience, laparoscopic cholecystectomy has undergone many refinements including reduction in the port size and number. Some surgeons have argued that the fourth trocar may not be necessary [6] and laparoscopic cholecystectomy can be performed safely without its use. In the experience of the proponents, three-port laparoscopic cholecystectomy is technically acceptable [7]. Cooperative manipulation of the surgical instruments is very important for using the three-port technique, especially for exposing Calot's triangle and dissecting the gallbladder from the hepatic bed. With further evolution of the technique and increase in surgical experience, some surgeons tried laparoscopic cholecystectomy via two ports only. This required the introduction of transabdominal sutures through the anterior abdominal wall for retracting the gallbladder while dissection [8]. The number of these sutures varies from one to three depending on the situation and the surgeon's preference. This was followed by the era of single port laparoscopy [8]. It required the use of a special port called the R-port. The R-Port is a Tri-port that allows the ingress of three 5mm

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instruments through a single port. An earlier modification of this was called single-incision laparoscopic cholecystectomy (SILC), using three 5mm ports from a single incision made at the umbilicus. Single port laparoscopy completely abolished all the scars from the anterior abdominal wall, except the natural umbilical scar. For a few surgeons, this was not enough, and no scar laparoscopy came into being called NOTES (natural orifice transluminal endoscopic surgery) [9]. This entails the use of natural orifices for the removal of the diseased organ. NOTES is an area of new development with potential advantages for patients. However, technical and ethical challenges involved in perforation and closure of a healthy organ, as seen in transgastric access, and lack of comprehension of physiopathology of these approaches have not allowed wide clinical use [9]. In March 2007, a 43-year-old female patient with symptomatic cholelithiasis was submitted to elective NOTES using a colonoscope, endoscopic graspers, and vaginal platform instruments [10]. Gallbladder can be removed through transanal, transvaginal, transcolonic and transgastric access with flexible endoscopic instruments, but these

techniques are still under development. While these developments are making invasive surgery less and less invasive, there are occasions where an open approach is needed. Developments in refining the open approach are also making an open approach less invasive. For example, our research team at Government Medical College, Srinagar, India has devised a technique, (the Chalkoo innovation) [11], in mini-laparoscopic cholecystectomy, in which we make an oblique 2.5 cm long incision in the right hypochondrium and perform cholecystectomy using retractors. In this approach, the cystic artery and cystic duct are tied with sutures using two long Kelly forceps. The results of this procedure are comparable to the laparoscopic cholecystectomy and we recommend it wherever laparoscopy is not available, feasible or the patient cannot afford it [11]. With the era of robotics, robotic and assisted laparoscopic cholecystectomy is now being performed successfully in experimental animals and volunteers and likely to have a good future [12]. Even though we have come far in the surgical management of gallstones, the field is still open for innovation.

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